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AVALANCHE RESCUE DOGS

SOME THOUGHTS
FROM A RESCUER



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Naco and friend

Photo by Scott
Nelson

It is the height of the winter avalanche season. All too soon an avalanche accident will happen and rescuers will dash out with hopes to save a life. When the rescue teams leave they are more and more frequently being accompanied by trained avalanche dogs. Even Powder Magazine has noticed, they featured a pictorial of avalanche dogs from North American ski areas in the October 1994 issue. There is no doubt that avalanche dogs save lives (Alpine Meadows, 1982, Jackson Hole, 1992, Kirkwood Meadows, 1993, Copper Mountain, 1994). In the United States from 1950 to 1994 dogs have found 21 bodies in avalanches. In Europe there have been many more successes. In Switzerland from 1945 to 1974 dogs found 45 avalanche victims alive. (During a 10 year period (1962-1972) dogs were used to search for 135 people. The dogs found 25 people

alive and 104 people dead. Only six people did the dogs not find. (Schild, 1975). Here in the United States more dogs are being trained for avalanche rescue every year. But as more dogs come into service, the more I have seen handlers and rescue leaders on actual rescues become frustrated when rescue dogs fail to find the victim.

Is it the dog's fault, or is it the fault of the handler and rescue leaders? In most cases the dogs worked well but the humans failed. Perhaps the biggest obstacle facing rescue leaders is not to contaminate the scene by eager rescuers. Food scrapes, tobacco spit and urine will drive a handler crazy as their dog races to and finds these objects. The scent from even parked snowmobiles, snowcats, helicopters and even portable heaters can foul a dog's scenting ability for minutes or even hours. But even if the avalanche debris can be kept clean there are four other common situations that can frustrate rescue leaders

and handlers: (1) the dog's alert doesn't fit with the location of the last seen area, (2) the dog alerts but doesn't find the victim, (3) the dog doesn't alert but you are certain someone is buried, and (4) the dog alerts in an area that has already been probed. A little understanding of scent diffusion and a new search tactic will help to find buried victims faster.

Those of you who know me and my dog (not a search dog—he can barely find his way out of a dark room) are probably wondering what qualifies me to write about avalanche dogs.

In 20 years of mountain rescue work along with quite a few years of professional ski patrolling I have participated in over two dozen avalanche search and rescues plus many more trainings. I have had the opportunity to learn from plenty of my own mistakes as well as from the mistakes made by others. In many of the operations I served in some sort of leadership

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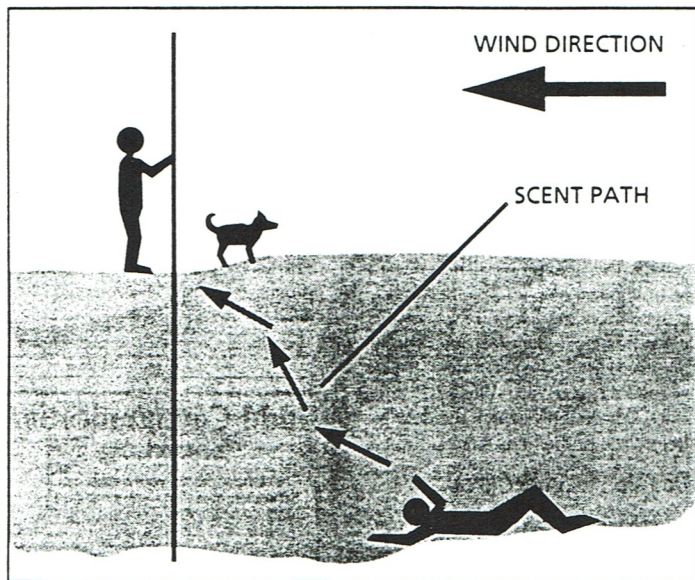


Figure 1. The dog alert is usually not over the victim.

role, frequently as the Accident Site Commander or Rescue Leader (great roles to make mistakes). To be an effective search and rescue leader, especially in avalanche rescue, one must know the capabilities and limitations of all resources, whether they be people, helicopters, hi-tech infrared scanners, search dogs or pack horses. I have always had a special interest in avalanche dogs. In my first avalanche rescue I watched a St. Bernard quickly locate a buried cross-country skier. The victim had been buried 8 days under 2 feet of debris.

the wrong spot. Witnesses are frequently incorrect in identifying where they last saw a person swept under the snow. This is why the spot is no longer referred to as the last seen point. Even if the witness can identify a spot within 50 feet of the actual location, wrong areas may be searched first. When a rescue dog alerts in an area that is not thought to be a high probability search-area, rescue leaders must learn to trust the instincts of the dog and search the new area.

Even if you are quite sure that the

LSA is accurately located, a dog can alert in an area that doesn't fit the location of the LSA (in terms of other clues and the flow of the debris). This is likely to occur when a victim has been buried very deep for days. It has to do with how a victim's scent diffuses through the snow. Scent diffusion leads us to the discussion of the next three situations.

Dog alerts but doesn't find the victim

Before addressing the specifics, let's review a typical avalanche dog training where someone is buried in the snow. The dog searches, picks up the scent and finds the opening of the training hole. No surprise. The

opening is loosely covered with blocks of snow. It offers the path of least resistance for the scent to reach the surface. Even inexperienced dogs routinely find the person and do so

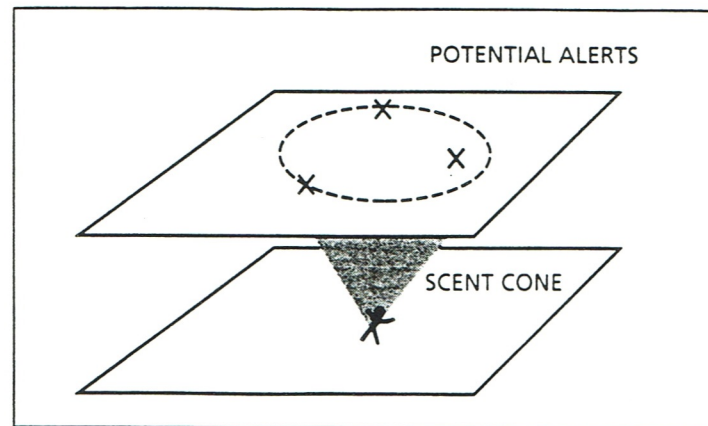


Figure 2. Scent cone from the buried victim.

But on actual rescues, all too often dogs alert but don't find the victim. Usually hours later probes find the body, and frequently not that far away from spots where the dog had indicated or showed a strong alert. The dog's handler goes away disillusioned wondering about what went wrong. "Why didn't the dog find the victim?"

Nothing is wrong with the dog. Dogs don't usually find avalanche victims. **Dogs find the scent.** Only when the victim is close to the surface do dogs dig down and actually find the person. Probably what went wrong is that the Accident Site Commander did not have the area around the dog alert adequately searched.

The reason why the alert was not adequately searched is the result of how dog alerts are searched. Here is what happens on avalanche rescues. The dog is accompanied by a handler and one (sometimes two) probes. When the dog alerts the spot is marked by a flagged-wand stuck into the snow. While the dog and the handler continue the search the alert is spot probed. This means the immediate area of the alert is randomly probed with maybe as many as a dozen pokes into the snow. Unless the burial is shallow, rescuers miss the victim. In real accidents the scent does not rise straight to the surface. The scent meanders through the debris as it seeks the path of least resistance, usually surfacing some distance away from the victim (Fig. 1). Thus the probe is not searching the right area.

It is common to have several alerts over an area. This usually confounds rescuers. Maybe the alert doesn't match the last seen area, or the alert does not fit the clues found.

to the buried victim, but it does mean that you are not too far away. The reason is that a scent cone spreads out from the victim to the snow surface as the scent follows several paths of least resistance and reaches the surface at different places and at different times (Fig. 2).

Search dog expert Sandy Bryson gives a terrific example of this principle in an article from the March 1986 issue of *The Avalanche Review*. On February 15, 1986, a massive avalanche destroyed a home in Twin Lakes, California. The avalanche buried and killed a 28-year-old man



living in the house under 35 feet of snow. Because of continued stormy weather and the threat of additional avalanches searchers could not reach the site until February 21. Two WOOF dog teams (a California search dog group) participated. Both dogs had several strong alerts the first day, but it was on the second day when crews bulldozed away 25 feet of snow that the dogs found the man. In Bryson's words:

"The scent had permeated everything in that small radius. The dynamics had to be an air scent cone that fanned outward and upward through the rubble and snow. By the time the scent got to the top of the surface snow 35 feet above after six days, it had to diffuse across a 30 foot diameter circle. Then they dug and bladed down [25 feet] to begin pinpointing the scent in a 6-foot radius nearer the body."

At this point we know why spot probing the alert sometimes doesn't



Learning the Game

Let's look more closely at the four problem areas that I have identified:

Dog alert doesn't fit with the location of the last seen area

You don't need to be a super

alerts over an area. To maximize the possibility of finding the victim, don't simply spot probe the dog alert; instead coarse-probe the alert area. The best way to do this (especially when rescuers are few) is to have three or four rescuers perform an open-order coarse probe

(Fig. 3). Four probes using this technique can quickly probe a 5.25 meter (17.5 feet) swath. There is no magic answer for where to start the search below the alert. You can try two side-by-side passes starting about 8 meters (26 feet) below to 8 meters above the alert. Patti Burnett, an experienced handler from Colorado, recommends searching into the wind for at least 15 meters (about 50 feet). If unsuccessful after the first pass of the probe line, you might repeat the search to increase the probability of detection, or enlarge the search area, before moving on.

To maximize your resources these probes can carry their own shovels and do their own digging. As more rescuers arrive they can be added as shovelers or other additional alert-probe teams can be deployed.

No alert but someone is buried

This is another scent diffusion issue, but instead of dealing with the spatial extent of the scent dispersion the issue becomes how quickly does the scent reach the surface. On several occasions, especially near ski areas that have a trained dog, the avalanche dog arrives within minutes of the accident. Witnesses are sure that someone has been buried. The dog searches but does not alert. Another rescue dog arrives—an hour later—from a nearby area and quickly finds the victim. The first dog handler heads home muttering to himself

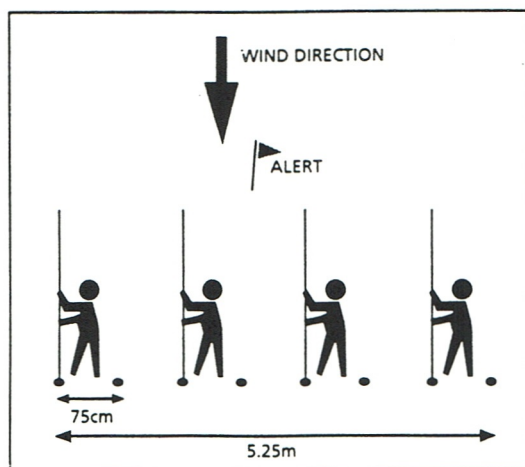


Figure 3. An open-order coarse-probe search of an alert.

about what went wrong.

Maybe nothing went wrong. The second dog just happened to be in the right place at the right time. The first dog arrived too soon, and the scent had not yet reached the surface. Bryson estimates that diffusion rates in slightly disturbed snow—even the heavy, wet “Pacific cement” stuff—used in trainings takes up to 15 minutes-per-meter. In actual avalanches I figure at least 15 min./m and maybe longer in very dense debris. But the diffusion rate is not just a function of the snow density and porosity, but also the weather conditions.

But another, important process may be at work: sometimes the scent may not quite reach the snow surface or if it does, it will not diffuse into the air. This is a function of the heat exchange that occurs at the snow surface. When the snow is losing heat, by radiation or molecular (conduction and convection) processes, the snow is also losing the scent into the air (Fig. 4). A light wind greatly increases the removal of heat and scent. But when the snow is absorbing heat, scent diffusion from the snow surface slows or can even reverse into the snowpack. Air temperatures warmer than the snow surface, new falling snow, rain and surface hoar development can add heat to the snow and stop the diffusion of the scent into the air.

Some ski areas use only their dogs to quickly search small slides, if the patrol is fairly sure that no one was buried. Keep in mind that if you arrive too soon, or if weather conditions are not favorable for scent diffusion you may miss someone. Watch out for the situation when the dog

sloppy rescuers have contaminated the snow and ruined the chances for the dog to find the scent.

There should be no problem for the late arriving rescue dog as long as rescuers have not contaminated the site. An experienced rescue dog is trained (or should be) to work right along side of other rescuers. The dog is searching for a scent emanating from the snow and will not be confused by other airborne-people scents. The only time you might want to hold rescuers back and let the dogs search first is when the search effort has most likely become a body search. Usually the morning of the second day is a good time to let the dog(s) thoroughly search the debris before the probe lines start.

Dog alert in probed area

Sometimes when rescuers arrive quickly at an avalanche and before the scent has risen, rescue dogs will alert in areas that have already been probed. Rescue leaders have dismissed the alert and not until hours later re-searched the area with a probe line and found the victim. If a portion of the scent cone is probed and perforated like Swiss cheese, the scent rises quickly to the surface.

It is not uncommon for buried victims to be missed on the first and sometimes second pass by a probe line. Remember that the probability of detection from one pass of a “perfect” coarse-probe line is only 76% (In other words, there is a one-in-four chance of missing on the first pass.) If probe-line spacing becomes erratic, or probes are not inserted vertically the probability of detection decreases rapidly.

When a dog alerts in an area that has already been probed it is important that the rescue leaders learn to trust the instincts of the dog. This strategy can also be used when rescue dogs arrive late to the site. Since probe lines perforate the snow, use dogs to purposely search probed areas.

Conclusion

Rescue dogs are a valuable resource in avalanche rescues. Even untrained dogs (the victim's dog) have found buried people. However, untrained dogs should be removed when trained rescue dogs arrive. The untrained dog often wanting to play (or fight) will distract the trained rescue dog. Trained dogs are most successful when rescue leaders understand the dog's capabilities and when the rest of the rescue team is well trained and practiced.

Rescue leaders should be flexible in their search strategy and be willing to redirect part of the search effort, even to what seems to be an unlikely area. They must also be aware of weather conditions that limit the diffusion of scent that naturally limits the dog's abilities. But don't artificially limit the dog's search abilities and hinder the rescue operation by

artificially search the alert area. You will find avalanche victims faster, and maybe even save a life. ❄

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